EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 2-01

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-12-060	09/30/2012 To 09/29/2015 Base Option Period Number 2	National Framework

Contractor	Specify Section and paragraph of Contract SOW
TETRA TECH, INC.	2d

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [ ] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 09/30/2014 To 09/29/2015

Comments:

[ ] Superfund — Accounting and Appropriations Data — [X] Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (Max 2): [ ]

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

Contract Period: 09/30/2012 To 09/29/2015 — Cost/Fee: — LOE:

This Action:

Total:

Work Plan / Cost Estimate Approvals

Contractor WP Dated: — Cost/Fee: — LOE:

Cumulative Approved: — Cost/Fee: — LOE:

Work Assignment Manager Name: Britta Bierwagen (Signature) (Date)	Branch/Mail Code: Phone Number: 703-347-8613 FAX Number:
Project Officer Name: Sharon Boyde (Signature) (Date)	Branch/Mail Code: Phone Number: 703-347-8576 FAX Number: 703-374-8696
Other Agency Official Name (Signature) (Date)	Branch/Mail Code: Phone Number: FAX Number:
Contracting Official Name: Mark Cranley (Signature) 09/29/14 (Date)	Branch/Mail Code: CPOD Phone Number: 513-487-2351 FAX Number: 513-487-2109

PERFORMANCE WORK STATEMENT
WA2-01

TITLE: National Framework and Regional Applications of Climate Change Vulnerability Assessment for Monitoring in Rivers and Streams

Work assignment Manager (WAM)	**Alternate Work assignment Manager (AWAM)**
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PERIOD OF PERFORMANCE: 09/30/2014 through September 29, 2015

EPA GLOBAL CHANGE RESEARCH PROGRAM

The EPA Office of Research and Development's Global Change Assessment Staff (GCAS) within the National Center for Environmental Assessment and the Air, Climate and Energy (ACE) National Program assesses the potential vulnerability[1] to climate change (and other global change stressors such as land-use change) of EPA's ecosystem, water, human health and air protection efforts at the federal, regional, state, municipal, and tribal levels, as well as adaptation options to build resilience in the face of these vulnerabilities. We carry out interdisciplinary syntheses across newly emerging scientific findings to identify potential impacts and characterize and communicate the uncertainty in the science to provide adaptation[2] support for decision makers and managers. Vulnerability and adaptation assessment activities in the aquatic ecosystems focus area support EPA's mission and responsibilities as defined by the Clean Water Act (CWA), and are designed to build the capacity of EPA program and regional offices, water and wetland managers, and other decision-makers to assess and respond to global change impacts on aquatic ecosystem processes and services.

BACKGROUND

The GCAS has worked with EPA's Office of Water, the Regions and states to assess the impact of climate change on bioassessment programs. This work has involved determining the sensitivity of bioindicators to climate change[3] and working more extensively with four states to examine historical trends in benthic macroinvertebrate data (http://www.epa.gov/ncea/global/regional_shops.htm). These efforts led to a more recent

[1] Vulnerability is defined as the degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes. It is a function of the sensitivity of a particular system to climate changes, its exposure to those changes, and its capacity to adapt to those changes.

[2] Adaptation refers to adjustment in natural or human systems in response to actual or expected climate stimuli or their effects, which moderates harm or exploits beneficial opportunities.

[3] U.S. EPA. Climate Change Effects on Stream and River Biological Indicators: A Preliminary Analysis (Final Report). U.S. Environmental Protection Agency, Washington, DC, EPA/600/R-07/085F, 2008.

project with states in EPA Regions 1-4 to create the analytical foundation for a climate change monitoring network capable of detecting impacts in streams. Workshops, webinars, and other presentations have led to subsequent interest by other regions and programs to conduct similar vulnerability assessments that support the development of monitoring networks to detect climate change-related effects in rivers and streams. WA1-01 made great strides with Regions 3 and 4 in terms of partner engagement, classification analyses, and vulnerability assessments. This amendment builds on the current results of WA1-01 and add tasks to involve Regions 5 and 7, their states and tribes, as well as continue original tasks with additional specifications.

PURPOSE OF THIS WORK ASSIGNMENT

The purpose of this work assignment amendment is to provide support to EPA to conduct vulnerability assessments at multiple scales that serve as the analytical foundation of monitoring networks capable of detecting climate change-related effects in rivers and streams. Specifically, deliverables from this work assignment amendment will inform a national framework and support new efforts in Regions 5 and 7. This work assignment amendment will also continue to advance analytical work on the types of benthic macroinvertebrate indicators that may respond most specifically to changes in the aquatic ecosystem due to climate change, through investigations of species traits. This work assignment amendment may also extend the traits work to fish, if suitable datasets are available in the regions of interest.

DESCRIPTION OF TASKS

TASK 1: **Continue communication and revise QAPP as necessary**

SubTask 1.1. Continue Communication Regular Reporting

Project meetings and other communications shall continue from WA 1-01 throughout the period of performance of this Work Assignment.

Task 1.1 Deliverable 1.1.A: Brief, written progress reports as email to the WAM. Due monthly or upon request by the WAM for the duration of this WA.

Task 1.1 Deliverable 1.1.B: Project meetings and other communications, such as conference calls, as needed. Due upon request by the WAM for the duration of this WA.

SubTask 1.2. Produce QAPP

All work conducted under this work assignment shall be performed pursuant to an EPA-approved Quality Assurance Project Plan (QAPP); If this is a continuation of the work under WA 1-01 and the scope of work is unchanged, then the QAPP for WA 1-01 shall be acceptable and shall be followed for this WA. For any new work, the contractor shall review the existing QAPP for WA 1-01 and update it as needed for this Work assignment. The update can be an addendum to the existing QAPP or a revision of the existing QAPP. The updated QAPP shall be submitted for review and approval by the WAM and the EPA QA Officer 14 days after Work assignment award. The QAPP shall be in conformance with EPA's *Requirements for Quality Assurance Project Plans* (EPA QA/R-5). Portions of this Work assignment relevant to modeling will reference *Guidance for Quality Assurance Project Plans for Modeling* (EPA QA/G-5M), while portions of this Work assignment relevant to geospatial data will reference *Guidance for Quality*

Assurance Project Plans for Geospatial Data (EPA QA/G-5G). Elements from these sources will be used to derive a single QAPP for this Work assignment.

All electronic deliverables (i.e., computer files) shall be submitted in a format acceptable to EPA.

The contractor shall not incur billable costs for Tasks 2 through 6, until receiving IN WRITING from the EPA Work assignment Manager that EPA has approved the QAPP.

Task 1.2 Deliverable 1.2.A: QAPP submitted to the WAM for review 14 days after WA award.

Task 1.2 Deliverable 1.2.B: A revised QAPP addressing WAM's and QA officer's comments on the QAPP due one (1) week after receiving comments.

TASK 2: Vulnerability assessment of rivers and streams to support monitoring

The work from WA0-01 and 1-01 have advanced both the theory and application of vulnerability assessments to support monitoring of climate change effects in streams. This task will finalize an article on advancing the application of vulnerability assessments and finalize analyses of vulnerability for Regions 1-4, including an article on the results. Results from these tasks may be suitable to present at national or regional meetings.

SubTask 2.1. Journal article on advancing the application of vulnerability assessments

This journal article shall discuss:

- Common conceptual models of vulnerability assessments
- Issues that arise when applying these conceptual models to real-world examples
- Data availability for current condition assessments vs. assessments of future condition
- Issues of spatial scale
- Methods to address these issues
- Examples
    - Assessing current vulnerability (e.g., EPA 2011)[4]
    - Scaling indicators, vulnerabilities
    - Qualitative assessments
    - Quantitative assessments
    - Need for data appropriate for goals
    - Differences in outcomes between addressing one specific vulnerability vs. overall vulnerability of system

This article shall be targeted at a journal that publishes shorter, theoretical pieces relatively quickly, such as Environmental Research Letters.

Task 2.1 Deliverable 2.1.A: Draft journal article based on comments on an annotated outline developed under WA1-01 amendment 2 due 12 weeks after WA initiation.

[4] U.S. EPA. Aquatic Ecosystems, Water Quality, and Global Change: Challenges of Conducting Multi-Stressor Vulnerability Assessments (Final Report). U.S. Environmental Protection Agency, Washington, DC, EPA/600/R-11/011F, 2011.

Task 2.1 Deliverable 2.1.B: Journal article submitted for internal review 4 weeks after receiving comments on Deliverable 2.1.A.

Task 2.1 Deliverable 2.1.C: Revised journal article based on internal review comments ready for submission to journal due 4 weeks after receiving comments on Deliverable 2.1.B.

SubTask 2.2. Journal article on vulnerability assessment of eastern streams

Based on discussions of the first draft developed under WA 1-01, finalize the analysis plan through conference calls with WAM and appropriate EPA staff. After agreement on the analysis plan, the contractor shall incorporate the updated results and maps into a revised draft journal article.

This journal article shall discuss, depending on the final analysis plan:

- Specific vulnerabilities chosen for analysis
- Data selection to address each vulnerability
- Modeling approach
    - Use of classification
    - Use of biological data
- Modeling probability of change in stream state
- Sensitivity analysis of minimums, maximums

Task 2.2 Deliverable 2.2.A: Call to discuss first draft developed under WA 1-01 and to finalize the analysis plan due 2 weeks after WA initiation.

Task 2.2 Deliverable 2.2.B: Finalize remaining analyses of vulnerability for East Coast (Regions 1-4), including maps, based on Deliverable 2.2.A due 6 weeks after Deliverable 2.2.A.

Task 2.2 Deliverable 2.2.C: Revise draft of journal article based on first draft from WA1-01 amendment 2 and results of Deliverable 2.2.B, due 8 weeks after Deliverable 2.2.B.

TASK 3: Analytical support for regional networks

EPA Regions 1-4 are now collecting data. Follow-up is needed to discuss lessons learned and share issues and solutions among the Regions.

Data infrastructure is another critical gap for Regions, in terms of solutions for continuous monitoring data. Several data management systems are available and could be piloted with selected states (potentially within Region 4) to develop more robust solutions for all regional networks. USGS has agreed to partner with EPA on assisting states and tribes with piloting several data management systems. It is anticipated that this work will require support in terms of organizing conference calls and webinars to discuss progress and results of the pilots.

Additionally, Regions 5 and 7 are interested in developing climate change monitoring networks for their rivers and streams. These Regions pose some new challenges in terms of classification and vulnerabilities. There are opportunities to incorporate BCG concepts into these monitoring networks, as well as make use of qualitative assessments developed by Tetra Tech for the Region 10 climate change and TMDL for the South Fork of the Nooksack River.

SubTask 3.1. Continue Interactions with Regional Steering Committees through calls and webinars

In collaboration with USGS, states, tribes, and EPA regions, develop a plan to pilot several continuous data management solutions, including ODM, 52North, and Aquarius. Region 4 expressed an interest in participating in such a pilot, as well as USGS CIDA. This process likely will require several conference calls and potentially webinar among interested participants. Interactions during regional meetings (e.g., SWPBA, AMAAB, or NEAEB) also may facilitate training on pilot systems and Regional and state participation. This task may include such conference travel.

Interact with RSCs through calls and webinars, particularly a webinar to debrief the 2014 sampling season and discuss results of the data management pilot once results are available.

> *Task 3.1 Deliverable 3.1.A*: Conduct planning calls and webinars with USGS and interested states, tribes, and EPA regions to develop a pilot on data management throughout WA.
>
> *Task 3.1 Deliverable 3.1.B:* Conduct a webinar with all RSCs to debrief sampling season and instrument deployment, as well as discuss next steps, due in October 2014.
>
> *Task 3.1 Deliverable 3.1.C:* Conduct a webinar with RSCs to discuss results of data management pilot due within 4 weeks of finalizing Deliverable 3.1.A or 2 weeks before the end of the POP.

SubTask 3.2. Analytical support to develop monitoring networks in Regions 5 and 7

Regions 5 and 7, as well as their states and tribes, have expressed interest in establishing regional monitoring networks to detect climate change effects. These regions will likely pose new challenges in terms of stream classification and vulnerability assessment. Initial analyses should focus on using the classification methodology developed for the East Coast using NARS data to assess any overlap with portions of these new Regions. Then analyses shall examine new classes within these Regions. The bulk of the analyses will be done within EPA, and the Contractor shall assist with data processing and analysis.

These Regions will likely not have many least-disturbed reference sites. Use of the Biological Condition Gradient (BCG) developed in IL (potentially elsewhere) may be applicable for defining reference sites in other condition classes. Sites may be selected using a combination of the classification, BCG, and vulnerability assessment based on thermal thresholds and climate velocities, and potentially other factors. Urban and agricultural reference site concepts, similar to the Reference Watershed Network sites, may be applicable as well. Qualitative and quantitative approaches from the Region 10 climate change and TMDL pilot may also be

applicable in terms of communicating vulnerability information and selecting monitoring sites that inform on restoration potential and climate change adaptation.

Task 3.2 Deliverable 3.2.A: Develop a schedule for planning calls to discuss BCG approaches and results from other efforts, as well as qualitative and quantitative approaches applied in Region 10 climate change and TMDL pilot due within 4 weeks of WA initiation.

Task 3.2 Deliverable 3.2.B: Assist EPA with cluster and classification analyses including Regions 5 and 7 due 4 weeks after Deliverable 3.2.A.

Task 3.2 Deliverable 3.2.C: Revision of climate velocities and examination of thermal thresholds data due 3 weeks after Deliverable 3.2.B.

Task 3.2 Deliverable 3.2.D: Draft results incorporating vulnerability information and approaches from Region 10 pilot to select monitoring sites in classes other than highest quality due 4 weeks after Deliverable 3.2.C.

Task 3.2 Deliverable 3.2.E: Webinars with Regions 5 and 7 steering committees to discuss potential monitoring sites, analyses and approaches for each Region, initial results due 2 weeks after each Deliverable under SubTask 3.2 and as appropriate before the final deliverable to elicit feedback.

SubTask 3.3. Provide Data Files

The Contractor shall provide to the WAM all modeling output generated in this Work assignment as digital computer files. The data shall be provided in a digital format specified by the WAM on an external hard drive with sufficient storage memory for storing all necessary files. The Contractor shall organize model output files in a directory and using a file-naming convention agreed upon by the WAM.

Task 3.3 Deliverable 3.3.: Transmit all modeling output data as digital computer files in a file directory and using a file-naming convention specified by the WAM. Due 2 weeks before the end of Option Year 2.

TASK 4: Synthesis of current research on climate-relevant traits and suites of traits

This task shall build on traits work developed under the initial WA1-01 as part of a synthesis of research on climate-relevant traits and suites of traits. Any experts in this field identified beyond the list generated in WA1-01 shall be selected based on relevant publications and research. These experts shall be contacted to form a steering committee to provide comments on analyses and results developed under WAs 0-01 and 1-01, and to present their own research to potentially develop a synthesis article.

This task shall be coordinated with the development of a synthesis traits article resulting from the ICARUS workshop that had as objectives to: 1) compare and contrast [trait-based] approaches; 2) learn from each other on how to improve trait-based assessments; and 3) better

integrate such assessments into management decisions, including understanding their limitations. Resulting discussions focused on differences in methodological approaches to assign vulnerability to species (modeling vs. expert elicitation). The EPA lead for that project is Henry Lee, II from EPA/WED. Participants in the ICARUS workshop also may be suitable additional ESC members.

Coordination with the ICARUS group will lead to either a set of short articles or one combined article on the state of the science for species traits and climate change. The Contractor shall facilitate interactions, including conference calls and webinars to further develop article outlines, assist with writing either the *freshwater traits* article or portion of larger article, and assist with editing the set of articles or combined article. If the ESC and ICARUS group decide on a set of articles, this may include: (1) an overview of the general structure and framework of the traits-based approach and comparisons between marine and freshwater (lead author likely Henry Lee, II); (2) a freshwater-focused paper; and (3) a marine focused manuscript. The goal is to publish the set of papers together as a special section or set of connected papers in a journal.

Subtask 4.1. Schedule expert steering committee (ESC) calls

The Contractor shall use the list of experts developed under WA 1-01 to schedule conference calls and webinars for the selected steering committee. Webinars shall include a presentation of analyses and results of work on traits from WA1-01, overview of the ICARUS workshop, and then brief overview presentations of the expert's work. The contractor shall then gauge interest in a synthesis article that describes the needs and benefits of trait-related work, particularly for analyses of climate change effects in freshwater systems.

> *Task 4.1 Deliverable 4.1*: Schedule initial conference call and subsequent webinars or calls according to availability of WAM and ESC members and deliverables. Initial call shall be scheduled within 6 weeks of approval of WA.

Subtask 4.2. Develop outline of synthesis article

Based on ESC input and interest, the Contractor shall develop a draft outline of a synthesis article.

> *Task 4.2 Deliverable 4.2.A*: Draft outline based on ESC input due 2 weeks after discussing this topic with the ESC (Deliverable 4.1).
>
> *Task 4.2 Deliverable 4.2.B:* Draft journal article on state of traits science, needs and gaps, particularly for climate change-related analyses in freshwater systems developed based on ESC input and revisions to Deliverable 4.2.A due 16 weeks after Deliverable 4.2.A.
>
> *Task 4.2 Deliverable 4.2.C:* Edit journal articles developed as part of set due 2 weeks after receipt of manuscripts by WAM.

Task 5: **EPA Report Revisions**

The Contractor shall respond to external review comments on the Regional Monitoring Networks report in a separate document and revise the report based on review comments.

Task 5 Deliverable 5: Finalize responses to external peer review comments in a separate document and final report due 6 weeks after receiving comments from WAM.

Task 6: **Journal Articles**

The Contractor shall assist with revisions to a submitted manuscript and assist with the development of another manuscript. The Contractor shall assist with revisions to the analytical framework for a Northeastern monitoring network manuscript. The Contractor shall assist with the development of a manuscript about the stream classification for the East Coast region, including potential additional analyses (e.g., identification of intermittent streams), data formatting, and map and figure development.

SubTask 6.1. Assist with revisions of submitted manuscript

The Contractor shall assist with revisions on the manuscript of the Northeastern analytical framework for monitoring.

Task 6.1 Deliverable 6.1: Revised analytical framework manuscript as submission to journal due 4 weeks after WA initiation.

SubTask 6.2. Assist with classification manuscript

The Contractor shall assist with a manuscript based on the classification analyses for Regions 1-4, including potential additional data and analyses (e.g., data for validation, validation analysis, identification of intermittent streams), data formatting, and development of figures and maps.

Task 6.2 Deliverable 6.2: Final figures and input to manuscript on classification analyses due 12 weeks after WA initiation.

SCHEDULE OF BENCHMARKS & DELIVERABLES:

Task No.	SubTask No.	DELIVERABLE	Incremental Schedule
1	**1.1**	**1.1.A.** Brief, written progress reports.	Due monthly or upon request by the WAM for the duration of this Work assignment.
1	**1.1**	**1.1.B.** Project meetings and other communications, such as conference calls, as needed.	Due upon request by the WAM for the duration of this Work assignment.
1	**1.2**	**1.2.A.** QAPP	Due 14 days after WA award.

1	**1.2**	**1.2.B.** Revised QAPP	Due 1 week after WAM comments
2	**2.1**	**2.1.A.** Draft journal article	Due 12 weeks after initiation
2	**2.1**	**2.1.B.** Internal review draft	Due 4 weeks after receiving comments from WAM on 2.1.A.
2	**2.1**	**2.1.C.** Revised draft for submission	Due 4 weeks after receiving comments from WAM on 2.1.B.
2	**2.2**	**2.2.A.** Call to discuss first draft and analysis plan	Due 2 weeks after initiation
2	**2.2**	**2.2.B.** Finalize analyses	Due 6 weeks after approval of Deliverable 2.2.A.
2	**2.2**	**2.2.C.** Revised draft journal article	Due 8 weeks after Deliverable 2.2.B.
3	**3.1**	**3.1.A.** Calls, webinars on data management pilot	Due as needed throughout WA
3	**3.1**	**3.1.B.** Follow-up webinar with RSCs	Due in October 2014
3	**3.1**	**3.1.C.** Webinar on data management pilot results	Due within 4 weeks of finalizing Deliverable 3.1.A.
3	**3.2**	**3.2.A.** Schedule of calls to discuss approaches	Due 4 weeks after initiation
3	**3.2**	**3.2.B.** Draft classification analyses	Due 4 weeks after developing approach from Deliverable 3.2.A.
3	**3.2**	**3.2.C.** Revised climate velocities and examination of thermal thresholds	Due 3 weeks after Deliverable 3.2.B
3	**3.2**	**3.2.D.** Draft results to select sites	Due 4 weeks after Deliverable 3.2.C.
3	**3.2**	**3.2.E.** Webinars with Regions 5 and 7	Due 2 weeks after each Subtask 3.2 deliverable
3	**3.3**	**3.3.** Transmit output data	Due 2 weeks before end of Option Year 2
4	**4.1**	**4.1.** Conference calls, webinars	Due 6 weeks after initiation
4	**4.2**	**4.2.A.** Draft outline	Due 2 weeks after call/webinar with ESC
4	**4.2**	**4.2.B.** Draft journal article	Due 16 weeks after Deliverable 4.2.A
4	**4.2**	**4.2.C.** Edit articles	Due 2 weeks after receipt of manuscripts
5	**5**	**5.** Finalize external peer review responses	Due 6 weeks after receipt of comments
6	**6.1**	**6.1.** Revised analytical framework manuscript	Due 4 weeks after WA initiation
6	**6.2**	**6.2** Final figures and input to classification manuscript	Due 12 weeks after WA initiation

REPORTING

All documentation and reporting under this Work assignment shall be in compliance with contract requirements. See contract clause F.2, F.3, and J.2 "List of Attachments, Number 2 - Reports of Work".

Additional requirements specific to this Work assignment are as follows:

Electronic deliverables must be in an original file format that can be supported by EPA after the end of the Period of Performance of the Work assignment. The standard office software at EPA is MS Office. The standard GIS software at EPA is ESRI ArcGIS.

TRAVEL

Travel to conferences or regional biologists meetings is anticipated.

CONTRACTOR IDENTIFICATION

Contractor personnel shall always identify themselves as Contractor employees by name and organization and physically display that information through an identification badge. Contractor personnel are prohibited from acting as the Agency's official representative.

The Contractor shall refer any questions relating to the interpretation of EPA policy, guidance, or regulation to the Work assignment Manager.

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 2-01

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-12-060	09/30/2012 To 09/29/2015 Base Option Period Number 2	National Framework

Contractor: TETRA TECH, INC.

Specify Section and paragraph of Contract SOW:

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SFO (Max 2): ☐

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Authorized Work Assignment Ceiling

	Contract Period	Cost/Fee	LOE
	09/30/2012 To 09/29/2015	$0.00	0
This Action:		$95,857.00	750
Total:		$95,857.00	750

Work Plan / Cost Estimate Approvals

		Cost/Fee	LOE
Contractor WP Dated:	10/15/2014	$95,857.00	750
Cumulative Approved:		$95,857.00	750

Work Assignment Manager Name: Britta Bierwagen (Signature) (Date)	Branch/Mail Code:	
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	FAX Number:	
Project Officer Name: Sharon Boyde (Signature) (Date)	Branch/Mail Code:	
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	FAX Number:	703-374-8696
Other Agency Official Name (Signature) (Date)	Branch/Mail Code:	
	Phone Number:	
	FAX Number:	
Contracting Official Name: Mark Cranley (Signature) 10/26/14 (Date)	Branch/Mail Code:	CPOD
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United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 2-01

☐ Other ☒ Amendment Number: 000001

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-12-060	09/30/2012 To 09/29/2015 Base Option Period Number 2	NFRA

Contractor	Specify Section and paragraph of Contract SOW
TETRA TECH, INC.	2b

Purpose:
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- ☒ Work Assignment Amendment
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This Action:		
Total:		

Work Plan / Cost Estimate Approvals

	Cost/Fee:	LOE:
Contractor WP Dated:		
Cumulative Approved:		

Work Assignment Manager Name: Britta Bierwagen (Signature) (Date)		Branch/Mail Code: Phone Number: 703-347-8613 FAX Number:
Project Officer Name: Ruth Corn (Signature) (Date)		Branch/Mail Code: Phone Number: 513-569-7920 FAX Number:
Other Agency Official Name (Signature) (Date)		Branch/Mail Code: Phone Number: FAX Number:
Contracting Official Name: Mark Cranley (Signature)	01/06/15 (Date)	Branch/Mail Code: CPOD Phone Number: 513-487-2351 FAX Number: 513-487-2109

PERFORMANCE WORK STATEMENT
WA2-01 Amendment 1

TITLE: National Framework and Regional Applications of Climate Change Vulnerability Assessment for Monitoring in Rivers and Streams

Task Order Manager (WAM)	**Alternate Task Order Manager (AWAM)**
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PERIOD OF PERFORMANCE: Award of WA through September 29, 2015

PURPOSE OF AMENDMENT 1

The purpose of this task order amendment is to add several subtasks to WA 2-01 to (1) work with RMN partners and their data in order to highlight progress to date and the benefits of the regional networks; (2) facilitate interactions between USGS and RMN partners for a data management pilot; and (3) respond to external review comments on a manuscript. The original tasks in WA 2-01 remain in effect.

DESCRIPTION OF AMENDED TASKS

SubTask 1.2. Revise QAPP

All work conducted under this work assignment shall be performed pursuant to an EPA-approved Quality Assurance Project Plan (QAPP); this QAPP may be a modification from WA 2-01. The contractor shall review this QAPP and update it as needed for this Task Order amendment. The QAPP shall be submitted for review and approval by the WAM and the EPA QA Officer 30 days after Task Order award. The QAPP shall be in conformance with EPA's *Requirements for Quality Assurance Project Plans* (EPA QA/R-5). Portions of this Task Order relevant to modeling will reference *Guidance for Quality Assurance Project Plans for Modeling* (EPA QA/G-5M), while portions of this Task Order relevant to geospatial data will reference *Guidance for Quality Assurance Project Plans for Geospatial Data* (EPA QA/G-5G). Elements from these sources will be used to derive a single QAPP for this Task Order.

TASK 3: **Analytical support for regional networks**

Three subtasks are added to this task, 3.4, 3.5, and 3.6. Subtask 3.4 develops materials to highlight results and progress from the RMN partners. Subtask 3.5 further enables interactions between USGS and RMN partners for the data management pilot mentioned in subtask 3.1.

Subtask 3.5 goes beyond conference calls to include assistance to the RMN partners with scripting and application deployment to use the 52°North Sensor Observation Service with USGS. Subtask 3.6 assists R1 with the development of a regional QAPP that RMNs can use.

SubTask 3.4. Materials to highlight RMN results and benefits of the networks

RMN partners are eager to show the value of annual data collection across a regional network of sites. This subtask shall develop materials to highlight RMN results to date and build the foundation for on-going analyses as more data are collected. Highlights should include results that are useful for both climate change and non-climate change-related applications. Potential results and analyses include:

- Illustrate trend detection potentially building off of MD's sentinel sites or using power analysis to show value of continuous monitoring
- Quantify inter-site and inter-annual variability to inform reference characterization (e.g., ANOVA, Bray-Curtis) to inform criteria, standards, designated uses, etc.
- Evaluate relationships between biology and continuous temperature across available RMN sites focusing on total, EPT, cold, and warm taxa with seasonal temperatures
- Establish thresholds to inform water quality standards and criteria (e.g., CT and MD examples) potentially illustrated with boxplots for other states with continuous temperature data
- Characterize responses and recovery from extreme events using VT, potentially NY for Irene and NC for drought examples
- Evaluate predictive models of species and habitat changes to inform management priorities. E.g., monitoring data can show site trajectories that allows for more targeted management as opposed to managing under a bet-hedging strategy. In other words, monitoring can determine which management scenarios are being realized.
- Evaluate adaptation strategies (e.g., eventually monitoring could show effectiveness of adaptation and restoration strategies that are implemented at sites or in watersheds)

The contractor shall propose analyses and present these to the RMN partners to get input on the highest priority results to showcase. The results shall be presented in a short, highly visual and communicative document (approx. 5 pages) that partners, Regions, and OW can use to discuss the value of the networks.

Task 3.4 Deliverable 3.4.A.: Draft description of proposed analyses, including data sources, application to state/OW programs, and figure to communicate result due 6 weeks after approval of amendment.

Task 3.4 Deliverable 3.4.B.: Webinar for RMN partners to discuss results to highlight and get input on highest priority results to analyze due 2 weeks after approval of Deliverable 3.4.A.

Task 3.4 Deliverable 3.4.C.: Draft analyses and communication product based on input from RMN partners and Deliverable 3.4.A due 6 weeks after Deliverable 3.4.B.

Task 3.4 Deliverable 3.4.D.: Final analyses and communication product due 2 weeks after approval of Deliverable 3.4.C.

SubTask 3.5. Facilitate interactions between USGS and RMN partners

RMN partners are volunteering to participate in a pilot data management project with USGS. The goal of the project is to understand how to facilitate QA/QC of continuous sensor data and making the data available using different data management applications such as 52 North and Aquarius where available. Some facilitation may be needed between pilot partners and USGS, particularly with the development and deployment of various scripts (e.g., R or Python) and computer applications.

Once partners are selected for the pilot and the workgroup understands specific IT issues for each agency/organization, the contractor shall draft a proposal for facilitating development and deployment of scripts and applications for specific partners in need of assistance.

> *Task 3.5 Deliverable 3.5.A.*: Draft proposal of partner assistance due 2 weeks after partners for the pilot are selected.
>
> *Task 3.5 Deliverable 3.5.B.*: Development and deployment of scripts and applications for selected partners due throughout data management pilot.

SubTask 3.6. Assist R1 with development of regional QAPP for RMNs to use

States, EPA regions, and other organizations involved with the RMNs have requested the development of a regional QAPP that covers all aspects of monitoring that each organization can use and customize if necessary. EPA R1 (Diane Switzer) has volunteered to take the lead in drafting such a regional QAPP. The contractor shall assist with this development effort by (1) pulling together existing information from the Best Practices and RMN reports, as well as previous engagement with partner organizations; (2) organizing 2-3 phone calls with RMN partners to facilitate information sharing for the QAPP; and (3) assisting with writing and editing of the QAPP.

> *Task 3.6 Deliverable 3.6.A.*: Identify and transmit existing information for a regional QAPP due 2 weeks after kick-off call with WAM and R1 representative.
>
> *Task 3.6 Deliverable 3.6.B.*: Schedule calls with partners during development of QAPP as needed during this subtask.
>
> *Task 3.6 Deliverable 3.6.C.*: Written contributions to regional QAPP due within 1 week of receiving comments from WAM.

TASK 4: Synthesis of current research on climate-relevant traits and suites of traits

This amendment slightly revises this task. In order to better coordinate across ACE research tasks, an overview article on the opportunities and challenges of traits for climate change vulnerability assessment will be done with Henry Lee II from EPA/WED, covering both marine

and freshwater species. This article is targeted towards *Frontiers in Ecology and the Environment*. Rather than establish an expert steering committee, this task now calls for contacting several of the experts proposed under WA 1-01 to recruit co-authors for the article.

Subtask 4.1. Selection of co-authors

The Contractor shall use the list of experts developed under WA 1-01 to propose 2-3 co-authors for the overview article. The WAM will contact the proposed co-authors and will share the draft outline.

Task 4.1 Deliverable 4.1: Proposed co-authors due 1 week after amendment approval.

Subtask 4.2. Assist with development of overview article

The Contractor shall assist with the writing and coordination of co-authors for the freshwater portion of the overview article. Coordination may include calls with Henry Lee II, freshwater traits co-authors, and the full set of authors for the article.

Task 4.2 Deliverable 4.2.A: Revisions to draft outline based on co-authors' input due 2 weeks after co-authors are confirmed (Deliverable 4.1).

Task 4.2 Deliverable 4.2.B: Draft section of journal article combining input from co-authors and revisions to Deliverable 4.2.A due 12 weeks after Deliverable 4.2.A.

Task 6: Journal Articles

SubTask 6.3. Assist with revisions of submitted manuscript

The Contractor shall assist with revisions on the wetlands resilience manuscript once external review comments are received from the journal.

Task 6.3 Deliverable 6.3: Revised wetlands resilience manuscript due 4 weeks after receipt of comments from WAM.

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 2-01

☐ Other ☒ Amendment Number: 000001

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-12-060	09/30/2012 To 09/29/2015 Base X Option Period Number	

Contractor: TETRA TECH, INC.

Specify Section and paragraph of Contract SOW:

Purpose:
- ☐ Work Assignment
- ☒ Work Assignment Amendment
- ☒ Work Plan Approval
- ☐ Work Assignment Close-Out
- ☐ Incremental Funding

Period of Performance: From 09/30/2014 To 09/29/2015

Comments:

☐ Superfund — Accounting and Appropriations Data — ☒ Non-Superfund

SFO (Max 2): ☐

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

	Cost/Fee	LOE
Contract Period: 09/30/2012 To 09/29/2015	$145,813.00	0
This Action:	$0.00	0
Total:	$145,813.00	1,148

Work Plan / Cost Estimate Approvals

	Cost/Fee	LOE
Contractor WP Dated: 01/21/2015	$0.00	0
Cumulative Approved:	$145,813.00	1,148

Work Assignment Manager Name: Britta Bierwagen	Branch/Mail Code:
(Signature) (Date)	Phone Number: 703-347-8613
	FAX Number:
Project Officer Name: Ruth Corn	Branch/Mail Code:
(Signature) (Date)	Phone Number: 513-569-7920
	FAX Number:
Other Agency Official Name	Branch/Mail Code:
(Signature) (Date)	Phone Number:
	FAX Number:
Contracting Official Name: Mark Cranley	Branch/Mail Code: CPOD
(Signature) 02/26/15 (Date)	Phone Number: 513-487-2351
	FAX Number: 513-487-2109

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 2-02

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-12-060	09/30/2012 To 09/29/2015 Base Option Period Number 2	Phase IV Analsysi and Reportin

Contractor	Specify Section and paragraph of Contract SOW
TETRA TECH, INC.	2e

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [ ] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 09/30/2014 To 09/29/2015

Comments:

☐ Superfund — Accounting and Appropriations Data — [X] Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (*Max 2*) ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

Contract Period:	Cost/Fee:	LOE:
09/30/2012 To 09/29/2015		
This Action:		
Total:		

Work Plan / Cost Estimate Approvals

	Cost/Fee:	LOE:
Contractor WP Dated:		
Cumulative Approved:		

Work Assignment Manager Name Thomas Johnson (Signature) (Date)		Branch/Mail Code: Phone Number 703-347-8618 FAX Number:
Project Officer Name Sharon Boyde (Signature) (Date)		Branch/Mail Code: Phone Number: 703-347-8576 FAX Number: 703-374-8696
Other Agency Official Name (Signature) (Date)		Branch/Mail Code: Phone Number: FAX Number:
Contracting Official Name Mark Cranley (Signature) 09/11/14 (Date)		Branch/Mail Code: CPOD Phone Number: 513-487-2351 FAX Number: 513-487-2109

Performance Work Statement
Tetra Tech, Inc.
Contract EP-C-12-060
Work Assignment 2-02

I. Title: Phase IV analysis and reporting on watershed and lake simulations of the effects of climate change on U.S. rivers and lakes

II. Period of Performance: Award though September 29, 2015

III. COR:
Thomas Johnson, Ph.D.
U.S. Environmental Protection Agency
Office of Research and Development
National Center for Environmental Assessment (8601-P)
1200 Pennsylvania Avenue, NW
Washington, DC 20460
703-347-8618 (phone)
703-347-8694 (fax)
johnson.thomas@epa.gov

Alternate COR:
Christopher Clark, Ph.D.
U.S. Environmental Protection Agency
Office of Research and Development
National Center for Environmental Assessment (8601-P)
1200 Pennsylvania Avenue, NW
Washington, DC 20460
703-347-8619
clark.christopher@epa.gov

IV. Background:

EPA ORD recently completed two water modeling projects assessing the potential effects of climate change on the quantity and quality of U.S. water resources. The first project, referred to as "20-Waterheds", evaluates the sensitivity of streamflow and water quality to climate change in 20 U.S. watersheds. The second project, referred to as the "Lakes" project, evaluates the potential effects of climate change on the thermal structure and mixing regime of different archetypes of lakes and reservoirs.

<u>20 Watersheds Project</u>
The "20-Watershed" project has generated an unprecedented, large dataset of watershed simulation results including daily time series of streamflow, total N, total P, and suspended sediment loads at approximately the HUC8 sub-watershed scale in 20 U.S. watersheds under a range of future climate and urbanization scenarios. Watershed modeling was conducted using the Hydrologic Simulation Program-FORTRAN (HSPF) and Soil and Water Assessment Tool (SWAT) watershed models. Model simulations and development of written manuscripts were completed under previous Work Assignments under this contract by Tetra Tech, Inc.

<u>Lakes Project</u>

The "Lakes" project involves 1-D lake modeling of the potential effects of climate change on the thermal characteristics of different archetypes of U.S. lakes and reservoirs. Lake modeling was conducted using the LSSS Lake model. Climate change scenarios are based the same projections used in the 20-watershed project: dynamically downscaled (50x50 km^2) output from four of the GCMs for the period 2041-2070 archived by the North American Regional Climate Change Assessment Program (NARCCAP). Model simulations were completed under a previous Work Assignment on this contract by Tetra Tech, Inc.

V. Objectives:

This Work Assignment is for technical support to develop, revise, respond to peer review, and otherwise see through to completion the publication in peer reviewed journals of 3 manuscripts based on the 20-Watersheds, and 2 manuscripts based on the Lakes project. Tasks may require statistical analysis of hydrologic and water quality simulation data, preparation of technical figures and tables, technical writing, technical reviews of written manuscripts, revising written manuscripts to address peer review comments, and other activities related to the production and dissemination of products resulting from these two projects. Specific tasks and deliverables are listed below.

VI. Tasks and Deliverables:

Task 1 – Prepare workplan, establish communication, and develop QAPP

SubTask 1.1. Prepare work plan and cost estimate

The Contractor shall prepare a work plan in response to this work assignment, outlining the proposed approach, expertise and staffing, and resources needed, and a schedule to complete each task. The work plan should identify potential data and tools needed and any potential problems that might be encountered during the execution of the work assignment.

SubTask 1.2. Establish communication

Establish communication with the COR and develop a regular reporting schedule The Contractor shall contact the COR and schedule a kickoff project meeting. In collaboration with the COR the Contractor shall also establish a schedule for regular progress reports, project meetings, and other communications throughout the period of performance of this Work Assignment.

> *Deliverable 1.2.A.* Brief, written progress reports as email to the COR. Due monthly or upon request by the COR for the duration of this Work Assignment.
>
> *Deliverable 1.2.B.* Project meetings and other communications, such as conference calls, as needed. Due upon request by the COR for the duration of this Work Assignment.

SubTask 1.3. Development of a QAPP

All work conducted under this Work Assignment shall be performed pursuant to an EPA approved Quality Assurance Project Plan (QAPP). The contractor shall develop a Quality Assurance Project Plan within 30 days after project start for review and approval by the TOM and the EPA QA Officer. The QAPP can be based directly on the previously approved QAPP developed for WA 1-02 in Option Year 1. The QAPP shall outline the approach and measures the Contractor will implement to ensure a high standard of quality in data analysis and written deliverables. The QAPP shall be in conformance with EPA's *Requirements for Quality Assurance Project Plans* (EPA QA/R-5). Portions of this Work

Assignment relevant to modeling will reference *Guidance for Quality Assurance Project Plans for Modeling* (EPA QA/G-5M), while portions of this Work Assignment relevant to geospatial data will reference *Guidance for Quality Assurance Project Plans for Geospatial Data* (EPA QA/G-5G). Elements from these sources will be used to derive a single QAPP for this Work Assignment.

Deliverable 1.3.A. A QAPP submitted to the COR. Due 2 weeks after award.

Task 2 – Revise 3 draft manuscripts based on 20 Watersheds project results as needed to complete and address journal peer review comments

Three manuscripts based on 20 Watersheds are now in different stages of preparation for publication in scientific journals. A manuscript addressing regional variability of hydrologic effects was submitted to the journal JAWRA, has been peer reviewed, and currently is in need of major revisions to address peer review comments *(Modeling streamflow and water quality sensitivity to climate change and urban development in 20 U.S. watersheds)*. Another manuscript addressing the sensitivity of hydrologic effects to downscaling approach has been submitted to the journal ERL and is currently being peer reviewed *(The effects of downscaling method on the variability of simulated watershed response to climate change)*. A final paper addressing the interaction between climate change and urbanization in preparation *(Relative effects of mid-21st century urban development versus climate change on streamflow and water quality endpoints)*. When completed, this paper will be submitted for publication to a suitable journal. Following peer review, revisions to the latter 2 manuscripts, possibly extensive, will be required to see these efforts through to publication. If either manuscript is not accepted by the selected journal, it will need to be revised and submitted to a different journal.

In consultation with the COR, the Contractor shall provide technical support to revise each of the three manuscripts to address journal peer review comments leading to acceptance of each manuscript for journal publication. In each case, after receiving peer review comments, the Contractor shall, in consultation with the COR, develop a strategy for revising each manuscript and provide technical support to make the necessary revisions, to document in writing the authors responses to peer review comments, and to re-submit each manuscript for publication. If any manuscript is rejected for publication by a journal, in consultation with the COR the contractor shall identify a suitable alternative journal for submission, and revise the manuscript as necessary for submission to the selected alternate journal.

All revisions and written materials shall be written in clear, concise prose consistent with the standards of peer reviewed scientific literature (e.g., suitable for publication in technical journals such as the Journal of the American Water Resources Association, Environmental Research Letters, Water Resources Research).

Deliverable 2.A. Revisions to manuscript to address journal peer review comments for manuscript titled "Modeling streamflow and water quality sensitivity to climate change and urban development in 20 U.S. watersheds". Due 4 weeks after receiving journal peer review comments.

Deliverable 2.B. Revisions to manuscript to address journal peer review comments for manuscript titled "The effects of downscaling method on the variability of simulated watershed response to climate change". Due 4 weeks after receiving journal peer review comments.

Deliverable 2.C. Contributions and revisions to address peer review comments on a manuscript addressing the relative effects of urban development versus climate change. Due 4 weeks after receiving from the COR a draft manuscript for review.

Task 3 – Revise draft manuscript based on the Lakes project as needed to address peer review comments, and provide technical support to develop, conduct data analysis, and complete an a new manuscript based on results from the Lakes project.

One draft manuscript based on results from the Lakes project has been completed and submitted for publication in the journal Climatic Change: (1) *Potential climate change effects on lake thermal and mixing dynamics*. This manuscript is currently being peer reviewed.

In consultation with the COR, the Contractor shall provide technical support to revise this manuscript to address journal peer review comments leading to its acceptance for journal publication. After receiving peer review comments, the Contractor shall, in consultation with the COR, develop a strategy for revising the manuscript and provide technical support to make the necessary revisions, to document in writing the authors responses to peer review comments, and to re-submit the manuscript for publication. If the manuscript is rejected for publication by its journal, in consultation with the COR the contractor shall identify a suitable alternative journal for submission, and revise the manuscript as necessary for submission to the selected alternate journal.

Other opportunities also exist for new analysis and publications from the Lakes project. The Contractor shall also provide technical support to develop, conduct data analysis as needed, and complete a new manuscript based on results from the Lakes projects.

The Contractor shall, in consultation with the COR, propose opportunities for a new analyses based on the Lakes dataset. Potential topics for the new Lakes manuscript include but are not limited to (1) mapping of lake archetypes from the previously completed analysis to actual U.S. lakes, and (2) implications of climate change for management of U.S. lakes and reservoirs. The COR will select a final topic for the new analysis/manuscript from those opportunities proposed by the Contractor. The Contractor shall then provide technical support to conduct analysis and complete the new manuscript.

Required technical support could include extracting and summarizing data from the Lakes project simulation dataset, statistical analysis of simulation results, preparation of figures and tables, and conducting literature reviews and technical writing. All written products shall be written in clear, concise prose consistent with the standards of peer reviewed scientific literature (e.g., suitable for publication in technical journals such as the Journal of the American Water Resources Association, Environmental Research Letters, Water Resources Research).

> *Deliverable 3.A.* Revisions to manuscript to address journal peer review comments for manuscript titled "Potential climate change effects on lake thermal and mixing dynamics". Due 4 weeks after receiving journal peer review comments.
>
> *Deliverable 3.B.* First draft manuscript on a new topic based on results from the Lakes project. Due February 1, 2015.
>
> *Deliverable 3.C.* Final draft manuscript on a new topic based on results from the Lakes project. Due 4 weeks after receiving comments on Deliverable 3.B

Task 4. Continuing Technical Support to EPA ORD and EPA Partners

The Contractor shall provide continuing technical support as needed to EPA and EPA partners to access or otherwise use the simulation dataset developed in the 20 Watersheds and Lakes projects. Technical support will include access to 20 Watershed (HSPF and SWAT) and Lakes (LISSS) models and input data, and accessing data from the 20-Watershed and Lakes datasets. Technical support shall not exceed 10 hours for the entire period of performance of this Work Assignment without approval of the COR. *Deliverable M3.A*: Technical support to EPA and EPA partners as needed and approved by the COR on accessing and use of 20-Watershed and Lakes project models and simulation datasets. Due as needed from award of Work Assignment through Sept. 28, 2015 (end of contract Option Year 2).

> *Deliverable 4.A. Technical support as needed to EPA partners for use of 20 watershed and Lakes project datasets. Due from award to September 28, 2015.*

Task 5. Secure publishing rights for page fees and open access fees for 3 manuscripts completed under this Work Assignment.

Three manuscripts completed under this WA will likely be published in peer reviewed scientific journals before the end of the POP; those described in Deliverables 2.A., 2.B., and 3.A. The Contractor shall pay the publisher of each manuscript publication page fees and fees for open access for each of these 3 manuscripts.

IX. Schedule of Milestones and Deliverables:

TASK	DELIVERABLE	SCHEDULE
1	1.2.A. Progress reports	Due monthly
1	1.2.B. Other communication	Due upon request by the COR
1	1.3.A. QAPP	Due 2 weeks after award
2	2.A. Revisions to manuscript "Sensitivity of hydrologic response to climate change"	Due 4 weeks after receiving peer review comments from the COR
2	2.B. Revisions to manuscript "Effects of downscaling on variability of response"	Due 4 weeks after receiving peer review comments from the COR
2	2.C. Revisions to manuscript "Relative effects of urban development versus climate change"	Due 4 weeks after receiving peer review comments from the COR
3	3.A. Revisions to manuscript "Potential climate change effects on lake thermal and mixing dynamics"	Due 4 weeks after receiving peer review comments
3	3.B. Draft manuscript on new topic based on "Lakes" modeling	Due February 1, 2015
3	3.C. Final manuscript on new topic based on "Lakes" modeling	Due 4 weeks after receiving COR comments on Deliverable 3.B
4	4.A. Technical support to EPA partners for use of 20 watershed and Lakes project datasets	Award through Sept. 28, 2015 (end of Contract Option Year 2)

X. Acceptance Criteria:
The Contractor shall prepare high quality technical and written deliverables. The Deliverables shall be edited for grammar, spelling, and logic flow. The technical information shall be reasonably complete and presented in a logical, readable manner. Figures submitted shall be of high quality similar to presentations developed for national scientific forums and should be formatted as jpeg or png files. Text deliverables shall be provided in Microsoft Word 2007 or compatible format.

XI. Conflict of Interest:
The Contractor warrants that, to the best of the Contractor's knowledge and belief, that there are no relevant facts or circumstances which could give rise to a conflict of interest, as defined in FAR subpart 9.5, or that the Contractor has disclosed all such relevant information.

The Contractor agrees to notify the Contracting Officer immediately, that to the best of its knowledge and belief, no actual or potential conflict of interest exists or to identify to the Contracting Officer any actual or potential conflict of interest the Contractor may have.

The Contractor agrees that if an actual or potential conflict of interest is identified during the performance, the Contractor shall immediately make a full disclosure in writing to the Contracting Officer. This disclosure shall include a description of actions which the Contractor has taken or proposes to take, after consulting with the Contracting Officer, to avoid, mitigate, or neutralize the actual or potential conflict of interest.

The Contractor shall continue performance until notified by the Contracting Officer of any contrary action to be taken.

XII. Management Controls:

1. The EPA will review and provide comments on the Work Plan and QAPP.

2. The EPA will also review and provide comments on subsequent deliverables.

3. The Contractor shall clearly identify itself as an EPA contractor when acting in fulfillment of this contract. No decision-making activities relating to Agency policy, enforcement or future contracting shall take place if the Contractor is present. If the Contractor has a need to meet with Federal employees on-site, then the Contractor personnel shall visibly wear identification in performance of this contract while on-site that will be issued by the Government upon arrival to the Federal facility.

4. Technical Direction: The WAM is authorized to provide technical direction that clarifies the statement of work as set forth in this work assignment. Before initiating any action under technical direction, the contractor shall ensure that the technical direction falls within the scope of work for this work assignment. The technical direction shall be issued in writing by the WAM within four working days of verbal issuance. This will be forwarded to the PO and CO for their information and necessary actions. The WAM/COR is the only person authorized to make changes to this work assignment or contract. The changes must have prior approval from the WAM/COR in writing as an amendment or modification to the work assignment or contract. Technical direction includes direction to the contractor that assists the

contractor in accomplishing individual tasks deemed appropriate under the Statement of Work, as well as comments and approval of reports and other deliverables

XIII. Notice Regarding Guidance Provided Under This Work Assignment:
Guidance by the Contractor is strictly limited to management and analytical support. The Contractor shall not engage in activities of an inherently governmental nature such as the following:

1. Formulation of Agency policy

2. Selection of Agency priorities

3. Development of Agency regulations

Should the Contractor receive any instruction from an EPA staff person that the Contractor ascertains to fall into any of these categories or goes beyond the scope of the contractor or work assignment, the Contractor shall immediately contact the Project Officer or the Contract Specialist. The Contractor shall also ensure that work under this individual work assignment does not contain any apparent or real personal or organizational conflict of interest. The Contractor shall certify that none exists at the time the work plan is submitted to EPA.

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 2-02

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-12-060	09/30/2012 To 09/29/2015 Base Option Period Number 2	Phase IV Analysis and Reportin

Contractor: TETRA TECH, INC.

Specify Section and paragraph of Contract SOW:

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [X] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 09/30/2014 To 09/29/2015

Comments:

[ ] Superfund — Accounting and Appropriations Data — [X] Non-Superfund

SFO (Max 2): [ ]

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
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5										

Authorized Work Assignment Ceiling

	Cost/Fee	LOE
Contract Period: 09/30/2012 To 09/29/2015	$0.00	0
This Action:	$46,278.00	294
Total:	$46,278.00	294

Work Plan / Cost Estimate Approvals

	Cost/Fee	LOE
Contractor WP Dated: 10/15/2014	$46,278.00	294
Cumulative Approved:	$46,278.00	294

Work Assignment Manager Name: Thomas Johnson (Signature) (Date)		Branch/Mail Code: Phone Number: 703-347-8618 FAX Number:
Project Officer Name: Sharon Boyde (Signature) (Date)		Branch/Mail Code: Phone Number: 703-347-8576 FAX Number: 703-374-8696
Other Agency Official Name (Signature) (Date)		Branch/Mail Code: Phone Number: FAX Number:
Contracting Official Name: Mark Cranley (Signature)	10/28/14 (Date)	Branch/Mail Code: CPOD Phone Number: 513-487-2351 FAX Number: 513-487-2109

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 2-03

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-12-060	09/30/2012 To 09/29/2015 Base Option Period Number 2	2b

Contractor: TETRA TECH, INC.

Specify Section and paragraph of Contract SOW:

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [ ] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 09/30/2014 To 09/29/2015

Comments:

☐ Superfund — Accounting and Appropriations Data — [X] Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (Max 2): ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
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4										
5										

Authorized Work Assignment Ceiling

Contract Period:	Cost/Fee:	LOE:
09/30/2012 To 09/29/2015		
This Action:		
Total:		

Work Plan / Cost Estimate Approvals

	Cost/Fee:	LOE:
Contractor WP Dated:		
Cumulative Approved:		

Work Assignment Manager Name: Susan Norton (Signature) (Date)	Branch/Mail Code: Phone Number: 703-347-8549 FAX Number:
Project Officer Name: Sharon Boyde (Signature) (Date)	Branch/Mail Code: Phone Number: 703-347-8576 FAX Number: 703-374-8696
Other Agency Official Name (Signature) (Date)	Branch/Mail Code: Phone Number: FAX Number:
Contracting Official Name: Mark Cranley (Signature) 09/29/14 (Date)	Branch/Mail Code: CPOD Phone Number: 513-487-2351 FAX Number: 513-487-2109

CONTRACT NUMBER: EP-C-12-060
WORK ASSIGNMENT NUMBER 2-03

TITLE: CADDIS Support

WORK ASSIGNMENT MANAGER (WAM):	**Susan Norton** U.S. EPA (MC 8623P) 1200 Pennsylvania Ave. NW Washington, DC 20460 Phone #: 703-347-8549 **Physical and Overnight Delivery Address:** Two Potomac Yard 2733 S Crystal Drive Arlington, VA 22202
ALTERNATE WA MANAGER:	**Michael Griffith** U.S. EPA (MS A-110) 26 W. Martin Luther King Dr. Cincinnati, OH 45268 Phone #: 513-569-7034
PROJECT OFFICER:	**Sharon Boyde** U.S. EPA (MC 8601P) 1200 Pennsylvania Ave. NW Washington, DC 20460 Phone #: 703-347-8576

PERIOD OF PERFORMANCE: September 30, 2014 to September 29, 2015

ESTIMATED LEVEL OF EFFORT: 756 labor hours

INTRODUCTION & BACKGROUND

The contractor shall carry out tasks related to ongoing Information Technology (IT) and related support for the Causal Analysis/Diagnosis Decision Information System (CADDIS). CADDIS provides ecological assessment resources for natural resource managers and academics in the context of cause-effect relationships.

The tasks described herein represent activities of low to high technical complexity involving basic maintenance of the CADDIS website and continued development of the website's literature-based evidence tools.

OBJECTIVES

The objectives of this work assignment (WA) are to assist EPA with:

- Finalization and deployment of revisions to the CADDIS ecological evidence database and its associated user interfaces (the Interactive Conceptual Diagram (ICD) application and the CADDIS Literature Resource (CADLit) and collaborative platforms.
- Continued maintenance of the CADDIS website, including trouble-shooting any operational issues associated with the current website.

The product will be revised ICD and CADlit applications on the contractor's server. Subsequent revisions and migration to the EPA server will be addressed in future work assignments.

MEETINGS

Throughout the WA performance period, the contractor shall schedule meetings (including conference calls and in-person meetings with the Work Assignment Contract Officer Representative (WA-COR) and Alternate WA-COR, as appropriate. For all meetings, the contractor shall prepare and e-mail meeting notes and action items to the WAM within two business days, in text format within e-mail. Meetings shall be planned for and incorporated within the following tasks as appropriate.

TASK 1: Prepare work plan, cost estimate, Quality Assurance Project Plan & monthly reports

The contractor shall prepare and submit a work plan and a cost estimate in response to this WA. This effort will require familiarity with CADDIS; expertise in ecology, information technology, Apex, Java and Flex programming, database management, and website design; and knowledge of the U.S. EPA Web Guidelines. The work plan shall include a schedule of deliverables and all interim deliverables.

The contractor shall adapt the Quality Assurance Project Plan (QAPP) prepared for WA-01-03 in response to this work assignment. The QAPP shall be written in accordance with U.S. EPA QA standards outlined in *Requirements for Quality Assurance Project Plans* (EPA QA/R-5), and provided to the WAM and the NCEA QA Manager in electronic form for approval, when the WP and cost estimate are submitted.

The contractor shall prepare and submit monthly reports detailing progress on WA tasks.

TASK 2: Revise literature-based evidence tools on CADDIS

The contractor shall complete revisions to the ICD application and CADLit on their development servers, as per the following subtask and additional details provide per technical directives issued via e-mail from the WA-COR/Alternate WA-COR.

EPA shall provide detailed comments on the draft ICD and CADLit user interfaces. EPA shall provide comments on the ICD/CADLit databases based on the QA of CADLit and organism/effect record review.

Sub-task 2.1 Finalize ICD/CADLit databases

Tasks include following.

The contractor shall:

- provide support (e.g., record downloads and schema review) for EPA's QA and organism/effect reviews
- correct field migration errors identified during the EPA QA of CADLit
- implement changes to the organism/effect records as identified by EPA
- retest the interchange of information with the Australian EcoEvidence database, and implement any revisions to the databases that are necessary from the test

Sub-task 2.2 Finalize ICD user interface

The contractor shall

- Incorporate EPA comments on first draft ICD redesign

Sub-task 2.3 Finalize CADLit user (public and administrator) interfaces

The contractor shall

- Finalize the CADLit public and administrator interfaces based on EPAs final interface review and the results of web exchange tests (see Sub-task 2.1).

Sub-task 2.4 Deploy ICD/CADLit database and interfaces onto the EPA server

- Support EPA throughout the ADC process
- Push all databases and applications to EPA's staging server
- Test all applications on staging, including information interchange
- Push databases and applications to production server
- Fix any bugs resulting from the transfer

TASK 3: Provide general technical support

The contractor shall provide EPA up to 32 hours of general technical support per written technical directives throughout the performance period. This support may include, but shall not be limited to, IT trouble shooting, creation of graphics and figures, organization and compilation of review comments, and other efforts.

DELIVERABLE SCHEDULE

Task	**Description** (deliverables)	**Due date (business days after WA initiation)**
1	**Prepare work plan, cost estimate & QAPP**	15
1	**Prepare monthly reports**	Monthly
2.1	**Meet on CADLit database QA**	60 days
2.2 and 2.3	**Meet on ICD and CADLit interface**	70 days
2.1	**Meet on organism/endpoint record changes**	90 days
2.1	**Final database deployed on TetraTech server**	120 days
2.2 & 2.3	**Final CADLit and ICD interfaces deployed on TetraTech server**	150 days
2.4	**Begin deployment on EPA server**	160 days
2.4	**Deployment on EPA server completed**	220 days
3	**IT support**	As needed
	Total Level of Effort	**756 hrs**

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 2-03

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-12-060	09/30/2012 To 09/29/2015 Base Option Period Number 2	Caddis Support

Contractor: TETRA TECH, INC.

Specify Section and paragraph of Contract SOW:

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [X] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 09/30/2014 To 09/29/2015

Comments:

☐ Superfund — Accounting and Appropriations Data — [X] Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (Max 2): ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

	Cost/Fee:	LOE:
Contract Period: 09/30/2012 To 09/29/2015	$0.00	0
This Action:	$84,664.00	574
Total:	$84,663.00	574

Work Plan / Cost Estimate Approvals

	Cost/Fee:	LOE:
Contractor WP Dated: 10/15/2014	$84,664.00	574
Cumulative Approved:	$84,663.00	574

Work Assignment Manager Name: Susan Norton (Signature) (Date)	Branch/Mail Code: Phone Number: 703-347-8549 FAX Number:
Project Officer Name: Sharon Boyde (Signature) (Date)	Branch/Mail Code: Phone Number: 703-347-8576 FAX Number: 703-374-8696
Other Agency Official Name (Signature) (Date)	Branch/Mail Code: Phone Number: FAX Number:
Contracting Official Name: Mark Cranley (Signature) 11/26/14 (Date)	Branch/Mail Code: CPOD Phone Number: 513-487-2351 FAX Number: 513-487-2109

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 2-05

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-12-060	09/30/2012 To 09/29/2015 Base Option Period Number 2	Indiana IBI Modernization

Contractor	Specify Section and paragraph of Contract SOW
TETRA TECH, INC.	2e

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [ ] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 09/30/2014 To 09/29/2015

Comments:

☐ Superfund — Accounting and Appropriations Data — [X] Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (Max 2): ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

Contract Period:	Cost/Fee:	LOE:
09/30/2012 To 09/29/2015		
This Action:		
Total:		

Work Plan / Cost Estimate Approvals

	Cost/Fee:	LOE:
Contractor WP Dated:		
Cumulative Approved:		

Work Assignment Manager Name: Brian Thompson (Signature) (Date)	Branch/Mail Code: Phone Number: 312-353-6066 FAX Number:
Project Officer Name: Sharon Boyde (Signature) (Date)	Branch/Mail Code: Phone Number: 703-347-8576 FAX Number: 703-374-8696
Other Agency Official Name (Signature) (Date)	Branch/Mail Code: Phone Number: FAX Number:
Contracting Official Name: Mark Cranley (Signature) 09/30/14 (Date)	Branch/Mail Code: CPOD Phone Number: 513-487-2351 FAX Number: 513-487-2109

PERFORMANCE WORK STATEMENT
Tetra Tech, Inc., Contract EP-C-012-060
Work Assignment 2-5

TITLE: Indiana IBI Modernization for Fish and Macroinvertebrate Communities

WACOR: Brian Thompson
Region 5
77 West Jackson Boulevard
Chicago, IL 60604
312-353-6066

ALTERNATE COR: Marietta Newell
Region 5
77 West Jackson Boulevard
Chicago, IL 60604
312-353-4543

PERIOD OF PERFORMANCE: Work Assignment Issuance to September 29, 2015

BACKGROUND

This work assignment will provide technical support to Indiana to (1) develop criteria and select reference sites from previously sampled Indiana Department of Environmental Management (IDEM) sites and (2) modernize the existing Indiana Index of Biotic Integrity (IBI) stream indices for fish and macroinvertebrate communities based on a more complete, recent data set for future use by IDEM in refining its programs.

IDEM collects fish and macroinvertebrates with other data (chemical parameters, nutrients, and habitat) to monitor the health of streams and rivers in Indiana. The Indiana Administrative Code [327 IAC 2-1-3] has narrative biological criteria that states "all waters, except those designated as limited use, will be capable of supporting a well-balanced, warm water aquatic community." The water quality standard definition of a "well-balanced aquatic community" is "an aquatic community which is diverse in species composition, contains several different trophic levels, and is not composed mainly of strictly pollution tolerant species" [327 IAC 2-1-9]. To measure whether or not the biological community is meeting this definition, IDEM uses an Index of Biotic Integrity (IBI) which is composed of 12 community characteristics. The 12 different characteristics can score a 1, 3, or 5 which represents the deviation from expected biological community structure (i.e. 5 = no deviation from expectations, 1 = severe deviation from expected biological community structure). The total score can range from 0 (no organisms) to 60 (excellent, comparable to "least impacted" conditions). At this time, Indiana expects streams to score at least 36 out of 60 to meet aquatic life use water quality standards.

The U.S. Environmental Protection Agency (U.S. EPA) evaluated IDEM's biological assessment program in January 2014. The review provided information on the strengths and limitations of the bioassessment program, resource allocation and prioritization for improving the bioassessment program, and integration of biological assessments to more precisely describe aquatic life uses and develop numeric biological criteria.

Modernization of the fish and macroinvertebrate IBIs was the most obvious and urgently needed refinement to the bioassessment program as stated in the evaluation of 13 critical technical elements for State bioassessment programs. The current fish IBI was developed from 1990-1995 with over 800 sites in Indiana for the six different Ecoregions in Indiana as well as different metrics based on temperature, watershed, and stream size. The current macroinvertebrate IBI was developed from 2004-2007 with 247 sites in Indiana going down to lowest taxonomic level; however, the metrics did not vary based on ecoregion, watershed or stream size. The fish and macroinvertebrate IBIs were developed and calibrated based on a normal distribution of stream conditions rather than sampling reference sites (remaining sites with least anthropogenic disturbance).

This project will enhance Indiana's monitoring strategy by refining core indicators (fish and macroinvertebrate community structure) used to assess aquatic life use in

- IDEM's Integrated Report, thus satisfying 305(b) and 303(d) reporting requirements to U.S. EPA
- Watershed characterization projects which identify critical areas and chemical/physical stressors to the biological communities
- Identifying improvements in the biological communities following watershed restoration efforts

The refinement of fish and macroinvertebrate IBIs will provide a more accurate assessment of ecological effects thus improving IDEM's diagnostic ability to identify causes of degradation in water quality.

C. ON-GOING RESPONSIBILITIES OF THE CONTRACTOR

The EPA Work assignment Project Officer (WACOR) will coordinate and set-up monthly working calls among EPA staff and the contractor's technical lead to discuss the status and progress of the work under this Work assignment. The contractor shall participate in these monthly calls. The frequency of the monthly conference calls may be modified based on project status at the request of the contractor and only as approved by EPA. The contractor shall notify the EPA WACOR of any problems, delays or questions as soon as they arise, including immediate notification of any Work assignment delays. The contractor shall provide a monthly status report in accordance with contract requirements which will be used for invoice review purposes. All reporting shall be provided in accordance with the PWS Sections G & H: ***Reporting and Deliverables (General Performance)***.

Generally, written materials including meeting summaries shall be furnished by the contractor within five (5) business days after request in draft form for the WACOR to review; then a final written deliverable would be expected within five (5) business days after receipt of written technical direction from the WACOR, including the WACOR's comments and edits to the draft deliverable.

D: TASKS

TASK 1: Kickoff Meeting

The Contractor shall participate in a Kickoff call with the EPA WACOR via conference call to discuss the following: points of contact, roles and responsibilities, Quality Assurance Project Plan (QAPP) protocols, timelines, the schedule of benchmarks, milestones and deliverables, establish dates and times for monthly calls and monthly technical progress reports and general Work assignment administrative information.

TASK 2: QAPP
The Contractor shall provide a Quality Assurance Project Plan (QAPP) that fully addresses the use of secondary data for purposes of the Work assignment (i.e., can be used in reference site selection and IBI development/updating).

The process for the new QAPP development and review is:

- Within 15 business days after Work assignment Award, the contractor shall prepare and submit for EPA review a draft Quality Assurance Project Plan (QAPP) documenting how quality assurance (QA) and quality control (QC) will be applied to the generation, collection, evaluation, analysis and use of environmental data.

- EPA will review the contractor's draft QAPP, and provide the Contractor with written approval or written comments.

- The Contractor shall submit a revised QAPP within 5 business days of receipt of the written comments on the draft QAPP, unless otherwise instructed by the EPA WACOR.

QAPP Requirements

The QAPP shall provide enough detail to clearly describe objectives of the project supported by the work assignment; the type of data to be collected, generated, or used under this work assignment to support the project objectives; the quality objectives needed to ensure that these will support the project objectives; and the quality assurance (QA) and quality control (QC) activities to be performed to ensure that any results obtained are documented and are of the type, quality, transparency, and reproducibility needed.

All major deliverables (e.g., Draft and Final Reports) produced by the contractor under this Work assignment must include a discussion of any QA/QC that arose during the data compilation and assemblage process.

The contractor shall immediately notify the EPA WACOR of any QA problems encountered that may impact the performance of this Work assignment, with recommendations for corrective action.

The contractor shall adhere to the Contract-level Quality Management Plan (QMP) in performing the scope of requested services in this work assignment. EPA expects the contractor's Cost and Technical Proposals will fully account for the completion of all QA-related tasks, reviews, and reporting described in the Contract-level QMP.

TASK 3: Modernization of IBI for fish and macroinvertebrates.
SUMMARY: Based on the inclusion of new data, the Contractor shall evaluate and revise Indiana's regionalization and classification scheme for stream fish and macroinvertebrate IBI models, revise or propose new IBI metrics if necessary, evaluate a discrete or continuous scoring procedure for the IBI metrics, determine thresholds for the selected IBI metrics and validate the final IBI models. For purposes of this Work assignment, "new data" consists of the most recent 10 years of data for the stream IBI updating (fish 2003-2013 and macroinvertebrates 2004-2013).

TASK 3.1: The Contractor shall participate in the project initiation conference call for the stream IBI updating and shall provide the EPA WACOR with notes from the call.

TASK 3.2: The Contractor shall compile and assemble existing Indiana biological assessment data (including, as relevant, biological, chemical, and habitat data) to a single, database for the development of stream IBIs. IDEM data is in Oracle which includes biological, chemical, and habitat data; however, the contractor will compile land use data as it is not currently available. In completing this task, the Contractor shall exercise expert knowledge in assembling and formatting databases from state and tribal water quality management programs. The Contractor shall conduct basic *QAQC* of the existing Indiana biological assessment data (i.e., checking for values, locations out of range). U.S. EPA will ensure that the data are provided to the Contractor.

TASK 3.3: In consultation with IDEM and U.S. EPA Region 5, the Contractor shall develop and provide to the EPA WACOR a framework and criteria for reference site selection. In completing this task, the Contractor shall exercise expert knowledge on the evaluation and development of reference sites and reference conditions.

TASK 3.4: The Contractor shall identify the biological metrics that should be used for the stream IBI updating. The Contractor shall conduct this task as follows:

1. In consultation with IDEM and U.S. EPA Region 5, the Contractor shall evaluate and revise the regionalization and classification scheme (e.g., temperature, ecoregion, stream size and slope) of waters based on combining the previous and new fish and macroinvertebrate data.
2. Following revisions to the existing regionalization and classification scheme, the Contractor, in consultation with IDEM and U.S. EPA Region 5, shall revise or propose new biological metrics for the fish and macroinvertebrate IBI models, based on combining the previous and new data.
3. In the revision or creation of new IBI metrics, the Contractor will evaluate discrete or continuous scoring procedures for IBI metrics and determine thresholds for the selected metrics.

In completing this task, the Contractor shall exercise expert knowledge in the evaluation and development of regionalization and/or classification schemes. The Contractor shall present the proposed biological metrics, scoring procedures, and thresholds for the selected metrics at a meeting in Indianapolis, Indiana with IDEM.

TASK 3.5: The Contractor shall recalibrate and validate the stream IBI models for macroinvertebrates and for fish, using the results of Task 3.4, above. In completing this task, the Contractor shall exercise expert knowledge in developing IBI models for streams.

TASK 3.6: The Contractor shall produce a draft report that includes 1) the stream IBI models and 2) a detailed description of the development of the IBIs, including selection of reference sites, analysis of biological metrics, determination of thresholds for the selected biological metrics, and development of the final IBI models. The Contractor shall produce a revised draft report if deemed necessary by the WACOR.

TASK 3.7: The Contractor shall revise the draft report as directed by the EPA WACOR and produce a final report that includes 1) the stream IBI models and 2) a detailed description of the

development of the final IBI models, including selection of reference sites, analysis of biological metrics, determination of thresholds for the selected biological metrics, and development of the final IBI models. In writing the final report, the Contractor shall make revisions to the draft report as directed by the EPA WACOR.

TASK 3.8: The Contractor shall hold a closing conference call with the EPA WACOR to review the results of the overall project and to provide recommendations on future steps to maintain the quality of Indiana's IBI models for fish and macroinvertebrates.

E. SCHEDULE OF DELIVERABLES

BASE YEAR (November 1, 2014 through October 31, 2015)

TASK	DELIVERABLE	DUE DATE
1	The Contractor shall participate in a Kickoff call with the EPA Work assignment Project Officer (WACOR) via conference call to discuss the following: points of contact, roles and responsibilities, Quality Assurance Project Plan (QAPP) protocols, timelines, the schedule of benchmarks, milestones and deliverables, establish dates and times for monthly calls and monthly technical progress reports and general Work assignment administrative information.	October 2014
2	The Contractor shall provide a Quality Assurance Project Plan (QAPP) that fully addresses the use of secondary data for purposes of the Work assignment (i.e., can be used in reference site selection and IBI development/updating).	October 2014
3.1	The Contractor shall participate in the project initiation conference call for the stream IBI updating and shall provide the EPA WACOR with notes from the call.	October 2014
3.2	The Contractor shall compile and assemble existing Indiana biological assessment data (including, as relevant, biological, chemical, and habitat data) to a single, database for the development of stream IBIs. IDEM data is in Oracle which includes biological, chemical, and habitat data; however, the contractor will compile land use data as it is not currently available. In completing this task, the Contractor shall exercise expert knowledge in assembling and formatting databases from state and tribal water quality management programs. The Contractor shall conduct basic *QAQC* of the existing Indiana biological assessment data (i.e., checking for values, locations out of range). U.S. EPA will ensure that the data are provided to the Contractor.	December 2015
3.3	In consultation with IDEM and U.S. EPA Region 5, the Contractor shall develop and provide to the EPA WACOR a framework and criteria for reference site selection. In completing this task, the Contractor shall exercise expert knowledge on the evaluation and development of reference sites and reference conditions.	February 2015

TASK	DELIVERABLE	DUE DATE
3.4	The Contractor shall identify the biological metrics that should be used for the stream IBI updating. The Contractor shall conduct this task as follows: 1. In consultation with IDEM and U.S. EPA Region 5, the Contractor shall evaluate and revise the regionalization and classification scheme (e.g., temperature, ecoregion, stream size and slope) of waters based on combining the previous and new fish and macroinvertebrate data. 2. Following revisions to the existing regionalization and classification scheme, the Contractor, in consultation with IDEM and U.S. EPA Region 5, shall revise or propose new biological metrics for the fish and macroinvertebrate IBI models, based on combining the previous and new data. 3. In the revision or creation of new IBI metrics, the Contractor will evaluate discrete or continuous scoring procedures for IBI metrics and determine thresholds for the selected metrics. In completing this task, the Contractor shall exercise expert knowledge in the evaluation and development of regionalization and/or classification schemes. The Contractor shall present the proposed biological metrics, scoring procedures, and thresholds for the selected metrics at a meeting in Indianapolis, Indiana with IDEM.	May 2015
3.5	The Contractor shall recalibrate and validate the stream IBI models for macroinvertebrates and for fish, using the results of Task 3.4, above. In completing this task, the Contractor shall exercise expert knowledge in developing IBI models for streams.	July 2015
3.6	The Contractor shall produce a draft report that includes 1) the stream IBI models and 2) a detailed description of the development of the IBIs, including selection of reference sites, analysis of biological metrics, determination of thresholds for the selected biological metrics, and development of the final IBI models. The Contractor shall produce a revised draft report if deemed necessary by the WACOR.	August 2015
3.7	The Contractor shall revise the draft report as directed by the EPA WACOR and produce a final report that includes 1) the stream IBI models and 2) a detailed description of the development of the final IBI models, including selection of reference sites, analysis of biological metrics, determination of thresholds for the selected biological metrics, and development of the final IBI models. In writing the final report, the Contractor shall make revisions to the draft report as directed by the EPA WACOR.	September 2015
3.8	The Contractor shall hold a closing conference call with the EPA WACOR to review the results	September 2015

TASK	DELIVERABLE	DUE DATE
	of the overall project and to provide recommendations on future steps to maintain the quality of Indiana's IBI models for fish and macroinvertebrates.	

Summary of Deliverables by Project:

TASK	DELIVERABLE	DUE DATE
Kickoff Meeting, Reporting and Communication		
1	Kickoff Meeting	October 2014
Quality Assurance Statement for Task 3		
2	Provide the Quality Assurance Project Plan	October 2014
Modernization of IBI for Fish and Macroinvertebrates		
3.1	Task 3 Project initiation conference call	October 2014
3.2	Development of biological assessment database	December 2014
3.3	Develop framework/criteria for reference site selection	February 2015
3.4	Selection of biological metrics and presentation of proposed biological metrics to IDEM in Indianapolis	May 2015
3.5	Development of IBI models	July 2015
3.6	Draft report on the IBI models	August 2015
3.7	Final report on the IBI models	September 2015
3.8	Closing conference call with EPA WACOR to review project results	September 2015

See contract level "Quality Assurance Surveillance Plan" for specific performance standards and indicators related to this Work assignment. All written materials must be compliant with Section 508 of the Americans with Disabilities Act.

When the Work assignment reaches 30 calendar days prior to the end of the Period of Performance in a given period, the contractor shall make a determination that the deliverables, milestones, benchmarks, and any outstanding technical direction from the WACOR, will be satisfactorily completed in the form requested in the PWS by the end of the Period of Performance and for the remaining funding that is available.

If the contractor determines one or more of the above-referenced items will not be able to be completed in the requested form within the period of performance and with the available funding, the contractor shall notify the WACOR and the CO immediately. Within 5 business days of said notification, the WACOR in coordination with the CO will provide technical direction concerning use of the remaining funding to prepare and furnish to the WACOR all interim draft deliverables, interim work products, and any working files in an electronic format which is supported by EPA, for eventual continuation of the project after the end date of the Work assignment.

F. REPORTING

All documentation and reporting under this Work assignment shall be in compliance with contract requirements.

G. DELIVERABLES AND GENERAL PERFORMANCE:

The contractor shall participate in meetings and conference calls arranged by the EPA Work assignment Manager with states receiving assistance under Task 5.

The contractor shall when requested by the WACOR provide supporting documentation when EPA is reviewing draft deliverables to facilitate EPA review and approval of the Contractor's work. Documentation will include the electronic files and detailed, written explanation of all steps and decisions. The Contractor is expected to comply with this request when it is received from the WACOR regardless of whether such a request is described in the individual tasks of this PWS. The Contractor is expected to furnish this information in such manner that no proprietary software will be needed for EPA to read, interpret, replicate or model any work product of this agreement, unless otherwise noted in this PWS or by written permission of the EPA WACOR. The objective is that anyone with the appropriate skill level can use the information produced under this Work assignment to check or duplicate the Contractor's work for replication and/or verification. With this understanding of how this Work assignment's data will be used, any elements essential to successfully replicating analysis shall be provided to EPA in a commonly-used format.

The Contractor shall provide both scientific/technical and editorial review as defined in section 2.6 of the Prime Contract Performance Work Statement on any Work assignment **draft** product before submission to the EPA WACOR for review. This process does not need to be performed by an independent peer reviewer. It is expected that all editorial review comments will be addressed before deliverables are furnished to the EPA WACOR for review (in the case of draft deliverables) or acceptance (in the case of final deliverables); and that questions raised by scientific/ technical review will be either addressed or discussed with the EPA WACOR prior to the contractor furnishing draft deliverables.

EPA anticipates that the contractor's work will be judged "satisfactory" according to the QASP if Work assignment Manager edits to deliverables are no more than ten percent (10%) of the content of any draft deliverable, or less than two percent (2%) of any final deliverable. In addition, EPA anticipates that the contractor's work will be judged "satisfactory" according to the QASP if less than ten percent (10%) of the pages of written final deliverables contain Work assignment Manager edits for such things as grammar, punctuation and format. The EPA WACOR can upon request furnish a copy of the EPA correspondence manual for the contractor's use.

Upon receipt of written technical direction from the WACOR, the contractor shall furnish:

- **all deliverables (draft and final) to EPA shall be furnished in an electronic version** and in an electronic format that EPA can support.

- **all final deliverables to EPA shall include one (1) electronic copy and two (2) paper copies.** All final deliverables shall be prepared according to EPA publication guidelines and shall be compliant with Section 508 of the **Americans with Disabilities Act**.

All submittals to EPA shall be formatted as described below.

Electronic submissions shall be made in the following manner: electronic Microsoft Word© for any written reports, summaries or analysis documents, Microsoft Excel© format for any and all spreadsheets, raw data, coding and modeling work (including all model runs with essential data to replicate model runs), and Microsoft Access© format for any and all databases or for other

data as is approved by the EPA WACOR in writing. **Final electronic submissions** shall be on Compact Disk (CD) or Digital Versatile Disc (DVD). The contractor may utilize an FTP, but only if the EPA WACOR gives written permission. Every electronic document and all of the sections, text, graphs, charts or figures shall be unlocked, open and editable so that EPA may make further changes.

Final paper submissions shall be made in the following manner: two (2) separate and identical copies of all deliverables must be submitted; each separate copy includes all the products due at that date (i.e., Task 1, 2, etc.), and must be submitted in one (1) or more bound volumes, as appropriate, with a title page, an executive summary describing the purpose and content, and an index, located inside the front cover of each bound volume, and electronic copies enclosed in envelopes (or other suitable means) bound in the respective volume. Although PDF versions of materials may be additionally submitted per the contractor's prerogative, neither electronic nor paper PDF versions will be acceptable as any final work product.

Appropriate electronic format that is supported by EPA and printing of all GIS data layers, maps, photos, bench sheets and other written material not easily printed or saved in the above formats will be discussed and a format agreed upon with the EPA WACOR prior to submittal by the contractor.

H. ANTICIPATED TRAVEL

All travel under this Work assignment shall be in compliance with contract requirements and only according to specific Technical Direction. Travel is anticipated for up to two Contractor personnel to travel to Indianapolis, Indiana to present the proposed biological metrics for fish and macroinvertebrates.

I. CONTRACTOR IDENTIFICATION

Contractor personnel shall always identify themselves as Contractor employees by name and organization and physically display that information through an identification badge. Contractor personnel are prohibited from acting as the Agency's official representative.

The Contractor shall refer any questions relating to the interpretation of EPA policy, guidance, or regulation to the EPA Work assignment Manager.

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 2-05

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-12-060	09/30/2012 To 09/29/2015 Base Option Period Number 2	Indiana IBI

Contractor: TETRA TECH, INC.

Specify Section and paragraph of Contract SOW:

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [X] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 09/30/2014 To 09/29/2015

Comments:

[ ] Superfund — *Accounting and Appropriations Data* — [X] Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (Max 2): ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

	Cost/Fee:	LOE:
Contract Period: 09/30/2012 To 09/29/2015	$0.00	0
This Action:	$159,704.00	1,120
Total:	$159,704.00	1,120

Work Plan / Cost Estimate Approvals

Contractor WP Dated: 11/11/2014	Cost/Fee: $159,704.00	LOE: 1,120
Cumulative Approved:	Cost/Fee: $159,704.00	LOE: 1,120

Work Assignment Manager Name: Brian Thompson (Signature) (Date)	Branch/Mail Code: Phone Number: 312-353-6066 FAX Number:
Project Officer Name: Sharon Boyde (Signature) (Date)	Branch/Mail Code: Phone Number: 703-347-8576 FAX Number: 703-374-8696
Other Agency Official Name (Signature) (Date)	Branch/Mail Code: Phone Number: FAX Number:
Contracting Official Name: Mark Cranley (Signature) 11/26/14 (Date)	Branch/Mail Code: CPOD Phone Number: 513-487-2351 FAX Number: 513-487-2109